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cyclonic disturbances of the part of the solar atmosphere in which these bodies lie. It may be of interest, perhaps, to put on record a similar appearance which was observed in 1866.

The Notes made at the time read thus:—

"Saw distinctly the granules. A spiral band of closely associated granules, ending in one of larger size (fig. 1). In one area near the centre of the Sun's disk, the granules appeared more elongated than usual (fig. 2), rather sparsely scattered, and the larger diameters very nearly in the same direction. In neighbouring areas the granules smaller and less elongated. Amongst these no general direction was observed."

On the Probable Errors of Transits of the First and Second Limbs of the Sun, observed by the Chronographic Method. By A. W. Downing, B.A. (Dublin).

It has always appeared to me, and I believe the impression prevails amongst most persons who are in the habit of constantly observing transits of the Sun, that the transit of the first limb is a more difficult observation than that of the second. This difficulty is occasioned, no doubt, by the fact, that in the case of the first limb the wires of the transit instrument are rendered faint by the glare of the advancing limb, whilst in the case of the second limb they appear as dark lines projected on the bright disk of the Sun as a background, and can be watched with ease during the transit of the limb. It occurred to me then, bearing this circumstance in mind, that it would be a matter of some interest to ascertain if the probable errors of transits of the Sun's first limb were sensibly greater than those of the second, and I accordingly entered upon the investigation, the results of which I have now the honour of laying before the Society. The materials used in the computation were the observations of the Sun made at Greenwich with the transit-circle from 1874, July, to the end of 1875, 100 complete transits having been observed during that time, and the mode of reduction being as follows: The time of transit over each separate wire has been reduced to the central wire by applying to the recorded time the adopted equatoreal interval between the wire and the central wire, corrected for Sun's declination and increase of right ascension in the interval, and thus for each complete transit we have nine "central wires." I then take the mean of these, and find the difference of each from the mean. This being done for each complete observation, we have a number of "apparent errors," from which the probable error is found by the usual formula.

The following Table exhibits the resulting probable errors found by this process, and I have added, for comparison, the results for the transit of a star, given by Mr. Dunkin in the *Monthly Notices*, vol. xxiv., p. 154:—

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Object.	Probable Error of a Transit over one wire.	Probable Error of a complete Transit.
	s	s
⊙ 1 L.	±0·072	±0·024
⊙ 2 L.	±0·063	±0·021
⊙ Centre	±0·048	±0·016
A Star	±0·051	±0·017

It appears from this Table that the probable errors of transit of the first limb is slightly greater than that of the second; both being, as might be expected, somewhat greater than that of a star.

It must be remarked that the numbers given above comprehend not only the errors of observation, but also those of the adopted equatoreal intervals of the wires and the errors arising from the operation of translating the punctures on the chronograph-barrels into figures; but these may safely be assumed to affect equally the observations of the first and second limbs, and so do not influence the relative magnitudes of the resulting probable errors.

I have, next treated separately the observations made by each person, and so found five results, one for each of the four regular observers, and one for a miscellaneous group of junior observers, composed chiefly of supernumerary computers. The observations are perhaps not sufficiently numerous to determine with accuracy the probable errors of each observer's transits, but they enable us to see the general tendency. The results are given in the following Table and are compared, as far as possible, with the corresponding values for a star, as in the first Table:

Object.	Probable Error of a Transit over one Wire.				
	Ellis.	Lynn.	Criswick.	Downing.	Junior Observers.
	s	s	s	s	s
⊙ 1 L.	±0·059	±0·059	±0·051	±0·061	±0·086
⊙ 2 L.	±0·050	±0·058	±0·058	±0·061	±0·068
⊙ Centre	±0·039	±0·041	±0·039	±0·043	±0·055
A Star	±0·053	±0·052	±0·048	...	...

It is thus seen—confirming the opinion that the transit of the first limb is the more difficult observation—that the larger probable error found in the general result for the transit of the Sun's first limb is mainly due to the observations made by the junior observers, the more experienced assistants observing both limbs with nearly equal accuracy; in fact, the general result for the four senior observers is practically identical for both limbs, viz. for the first $\pm 0^{\mathrm{s}}\cdot 057$, and for the second $\pm 0^{\mathrm{s}}\cdot 058$, for a transit over one wire.

We may conclude, then, that for observers of experience the mean results of transits of the Sun observed by the chronographic method will be equally accurate for both limbs; but that for persons who are only occasionally employed in observing transits there will be a tendency to observe the first limb with less

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accuracy than the second, the transit of the first limb being the more difficult phenomenon to observe, and requiring care and practice for its accurate observation. The only account of a previous investigation of this nature that I know of is to be found in the *Proceedings of the Royal Irish Academy*, vol. vii. p. 371, where Dr. Robinson states that, from his observations made at Armagh in 1830, he found for the probable error of transit of Sun's first limb $\pm 0^{s}\cdot116$ and for that of second limb $\pm 0^{s}\cdot087$, whilst stars gave the result $\pm 0^{s}\cdot097$ (these observations, of course, were made by the "eye and ear" method); but I can discover no further details of this computation.

As an *addendum* to this paper, though not immediately connected with the subject of it, I may mention that I find that Argelander states (*Vierteljahrsschrift der Astron. Gesellschaft*, 1872, p. 16) that a transit over the first wire of a set is not as accurate as that over succeeding wires; and as I had the materials at hand, I thought I might as well test the statement in the case of the transits of the Sun observed at Greenwich. I have accordingly computed the probable errors of transits of the Sun's limb over wire i. and over wire ix. of the system of nine wires used for the observation of transits by the galvanic method, with the following result:—

	Probable Error of a Transit	
	over Wire i.	over Wire ix.
	s	s
⊙ 1 L.	± 0·075	± 0·073
⊙ 2 L.	± 0·071	± 0·070,

thus showing a slightly smaller probable error for wire ix.; but I know not whether it is decided enough to confirm Argelander's opinion, or ought to be considered as merely accidental.

On the Evidence of Periodic Variability of the Nebula H. II. 278, 1860·0, $\alpha = 2^{h}\ 23^{m}\ 25^{s}$, $\delta = -1^{\circ}\ 43'\cdot0$. By Prof. Winnecke.

Astronomers are unanimous, with regard to the variability of nebulæ, only about the variability of *one* Nebula, the very interesting object discovered by Mr. Hind, 1852, October 11, in $\alpha = 4^{h}\ 13^{m}\ 48^{s}$, $\delta = +19^{\circ}\ 11'\cdot2$ for 1860, which has been easily observed with the annular micrometer of a 4½-inch refractor by D'Arrest in the years 1855 and 1856. This Nebula has now completely vanished; it is not visible at present in our most powerful telescopes.

During the construction of the University Observatory at Strasburg, and in expectation of the 20-inch refractor* by Merz, mounted by Repsold, which is intended to be used for a thorough

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* Merz has finished two very good object-glasses of 20-inch free aperture; one of them has been purchased, after severe trial by myself, for Strasburg in September last.